The North African Journal of Scientific Publishing (NAJSP)
مجلة شمال إفريقيا للنشر العلمي (NAJSP)
E-ISSN: 2959-4820
Volume 3, Issue 3, 2025
Page No: 199-212
Website: https://najsp.com/index.php/home/index
SJIFactor 2024: 5.49 معامل التأثير العربي (AIF) 2024: 0.71 ISI 2024: 0.696

Challenges of Implementing and Adopting Cloud Computing in Higher Education: A Case Study Exploring Faculty and Student Perspectives at the Faculty of Science, University of Derna

Huweida A. Darbi [1*], Rabab R. Algadhy [2], Dalya A. Qatish [3]
[1, 2, 3] Department of Computer, Faculty of Sciences, University of Derna, Derna, Libya

تحديات تطبيق وتبني الحوسبة السحابية في التعليم العالي: دراسة حالة تستكشف وجهات نظر أعضاء هيئة التدريس والطلاب في كلية العلوم، جامعة درنة

هويدا عبدالعزيز دربي[1*]، رباب رافع القاضي[2]، داليا بوبكر قاطش[3]
[1،2،3]قسم الحاسوب، كلية العلوم، جامعة درنة، درنة، ليبيا

*Corresponding author: huweida.darbi@uod.edu.ly

Received: July 03, 2025	Accepted: August 16, 2025	Published: August 22, 2025

Abstract:
The significant developments in the fields of information and communications technology, along with the increasing speed of the Internet, have led many information institutions to adopt cloud computing for their applications. This technology offers users advanced features, such as providing information services to a large number of beneficiaries, storing and processing data, and accessing applications and user services via the Internet without restrictions related to location or time. Therefore, integrating this technology into higher education became necessary to raise awareness about information technology and to equip students and faculty members with the knowledge, skills, and technical expertise needed to improve their performance and incorporate technological innovations into communication and educational processes. This paper aims to explore the possibility of employing cloud computing as a new technological tool at the Faculty of Science, University of Derna, identify obstacles to its implementation in university education, advance university education through modern technology, promote awareness of its importance, and address the fears of professors, students, and administration related to its use. Additionally, it seeks to examine the future of university education in the era of cloud computing. A questionnaire was designed to measure the stratification level and opinions of both students and faculty members about the possibility of employing the cloud computing services in the university of Derna. The two groups have shown high satisfaction for using cloud computing services. However, some major obstacles that may impede employing cloud computing services were determined, such as infrastructural deficiencies, the unavailability of internet, and a lack of enough digital skills by both groups.

Keywords: Cloud Computing, Higher Education, Educational Technology, Cloud-Based Learning, Challenges Of Cloud Adoption In Universities.

الملخص
لقد أدت التطورات الكبيرة في مجالات تكنولوجيا المعلومات والاتصالات، إلى جانب زيادة سرعة الإنترنت، إلى اعتماد العديد من المؤسسات المعلوماتية على الحوسبة السحابية في تطبيقاتها. توفر هذه التقنية للمستخدمين ميزات متقدمة، مثل تقديم خدمات المعلومات لعدد كبير من المستفيدين، وتخزين ومعالجة البيانات، والوصول إلى التطبيقات وخدمات المستخدم عبر الإنترنت دون قيود مرتبطة بالمكان أو الزمن. لذلك، أصبح دمج هذه التقنية في التعليم العالي ضرورة لرفع مستوى

الوعي بتكنولوجيا المعلومات، وتزويد الطلاب وأعضاء هيئة التدريس بالمعرفة والمهارات والخبرة التقنية اللازمة لتحسين أدائهم ودمج الابتكارات التكنولوجية في عمليات الاتصال والتعليم. تهدف هذه الورقة إلى استكشاف إمكانية توظيف الحوسبة السحابية كأداة تكنولوجية جديدة في كلية العلوم بجامعة درنة، وتحديد العقبات التي قد تواجه تنفيذها في التعليم الجامعي، وتعزيز التعليم الجامعي من خلال التكنولوجيا الحديثة، وزيادة الوعي بأهميتها، ومعالجة المخاوف المتعلقة باستخدامها لدى الأساتذة والطلاب والإدارة. بالإضافة إلى ذلك، تسعى الورقة إلى دراسة مستقبل التعليم الجامعي في عصر الحوسبة السحابية. وقد تم تصميم استبيان لقياس مستوى توزيع الآراء لدى كل من الطلاب وأعضاء هيئة التدريس حول إمكانية توظيف خدمات الحوسبة السحابية في جامعة درنة. وأظهرت المجموعتان رضا عالٍ عن استخدام خدمات الحوسبة السحابية. ومع ذلك، تم تحديد بعض العقبات الرئيسية التي قد تعيق توظيف هذه الخدمات، مثل ضعف البنية التحتية، عدم توفر الإنترنت، ونقص المهارات الرقمية الكافية لدى كلا المجموعتين.

الكلمات المفتاحية: الحوسبة السحابية، التعليم العالي، تقنية تعليمية، تعليم قائم على السحابة، تحديات تبني الحوسبة السحابية في الجامعات.

Introduction

Recent decades have witnessed a tremendous development in information and communication technologies, the most prominent of which was the emergence of cloud computing, which has brought about a qualitative shift in how data is stored, processed, and shared over the Internet [1]. Cloud computing relies on providing computing resources as a service so that users can access them remotely, without the need to own an advanced physical infrastructure [2]. This technology has contributed to improving the efficiency of institutions and increasing their productivity, as well as reducing operating costs [3].

Cloud computing is one of the main pillars of digital transformation in various fields, including the health sector, where it is used to securely store electronic medical records (EMRs), facilitate remote access, and perform advanced analytics on health-related data to support diagnosis and personalized care [4] [5]. Business sector: It contributes to accelerating business processes, real-time access to business resources and providing collaborative work environments across supply chains and distributed teams through cloud-based services such as Google Workspace [6] [7]. Artificial intelligence and data analysis sector: Cloud computing platforms provide powerful computing environments for processing big data and training artificial intelligence models [8] [9]. Cybersecurity sector: Cloud computing solutions provide modern technologies to protect sensitive data and secure digital transactions through advanced authentication and encryption systems, ensuring integrity, confidentiality, and accessibility in cloud environments [10] [11].

Cloud computing has also revolutionized higher education, providing universities and academic institutions with innovative solutions to improve the learning and teaching process, enhancing the quality of education, facilitating access to knowledge and accessibility to resources, streamlining administrative operations, and providing a more efficient and flexible learning environment [12]. As this technology continues to evolve, its potential to provide more advanced solutions to the higher education community will increase, opening new horizons for scientific research and interactive learning. Despite these advantages, several challenges hinder the effective adoption of this technology, including resistance to change, lack of awareness, security concerns, and infrastructural limitations [13].

There several literatures about cloud computing in high education for instance, Yuliya Yu. [14] explored the application of cloud technologies in university educational processes, emphasizing their role in improving efficiency and fostering interaction between students and faculty members. regarding the challenges of adopting cloud computing solutions, L. S. Riza et al. [15] conducted a case study in the Republic of Kosovo, identifying technical, organizational, and cultural obstacles that hinder effective adoption in higher education institutions. Similarly, Chia Zhi Xuan and Muhammad [16] critically analyzed the impact, suitability, and challenges of cloud computing in higher education, discussing both the opportunities and barriers faced by educational institutions.

Focusing on key factors influencing the adoption of mobile cloud computing, Abdallah et al. [17] examined a case study at An-Najah University, analyzing motivators and inhibitors affecting cloud technology usage among students and faculty. Additionally, Al-Hajri et al. [18] investigated cloud computing adoption in Omani higher education during the COVID-19 pandemic, highlighting how emergency circumstances accelerated the uptake of cloud services. Locally, Imraja et al. [19] proposed a cloud computing model tailored for Libyan higher education institutions, addressing the specific challenges and opportunities these institutions face in implementing cloud-based solutions.

Collectively, these studies offer both theoretical insights and empirical evidence that provide a robust foundation for understanding the current landscape of cloud computing in higher education. They underscore the significance of examining the challenges and opportunities pertinent to the specific context of this study. So, we can say that the use of cloud computing in university education has become necessary due to its benefits and advantages, as this technology helps students, faculty members, and administrators alike to access applications and information wherever there is an Internet connection. It is one of the most interesting applications that can become a new trend in university education, as it facilitates quick access to various university applications and information through the Internet.

One of the obstacles to applying of cloud computing in university education is the lack of the skill of using modern technology in education in general and in the use of cloud computing. Based on the above, the research problem was identified as follows:

- What are the difficulties facing the use of cloud computing technology in the College of Science university of Derna from the perspective of faculty members and students?

What is Cloud Computing?

Although cloud computing is a terminology that has been known for decades, recently cloud computing has received significant attention around the world. The concept of computing in the cloud refers to delivering internet technology (IT) services using web browsers whether using familiar tools such as email and personal finance or new-generation tools such as social networks and virtual networks [20].

Cloud computing platform provides servers with dynamic access to a large data center to address clients' needs. It is known as the World-Wide Computer because It is based on connections, services, and software combined to achieve numerous tasks over a network. This technical process is known as the cloud. Physically, it works like a huge computer in the cloud that is directed to wider users especially those who do not have personal computers. Cloud computing allows users to access the power of supercomputer-level to store and operate their data via firms that rent storage capacity and computing power from a service provider. Recently, many companies such as Google, Microsoft, and Amazon have revolutionized cloud computing services with photo-sharing applications, writing tools, and online data storage [21].

Definitions of cloud computing vary depending on technical and managerial perspectives. For example, Rajkumar et al. [22] define it as "a distributed computing system in which computational resources are dynamically pooled and delivered as a service", while Michael Armbrust et al. [23] see it as "Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services." On the other hand, Ling Qian et al. [24] define cloud computing, that " a kind of computing technique where IT services are provided by massive low-cost computing units connected by IP ". while The National Institute of Standards and Technology (NIST) characterizes cloud computing as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

Role of Cloud Computing in higher Education

Cloud computing plays a pivotal role in improving the educational process by providing a flexible and effective learning environment for both students and lecturers. This technology allows access to educational resources and applications from anywhere and at any time, enhancing the learning and teaching experience. Therefore, we find that the benefits of its application in universities can be summarized as follows include the following [25][26]:

- It helps students use applications without downloading them to their devices and helps them access stored files from any computer and all programs at any time, from anywhere via an Internet connection.
- Ease of communication between students and faculty members.
- Ease of evaluating tests, accessing homework...etc.
- Ease of access to educational materials whenever a faculty member provides or publishes them.
- The ability to conduct final exams over the Internet (online).
- Obtaining immediate feedback from the student and faculty member (feedback between students and professors).
- Distribute and evaluate online tests, exams, homework, projects, and exercises at any time.
- There is no rental or building cost for the university because learning is online.

- Central storage of data and applications makes access to them quick and easy.

Figure 1 shown the main users of higher education cloud include students, Faculty, administrative staff, Examination Branch and Admission Branch.

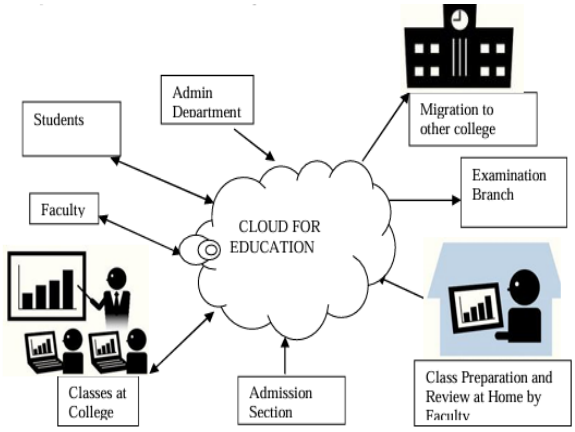

Figure 1: Services attached to Education Cloud [27].

Difficulties of applying cloud computing in university education

The difficulties of the use of cloud computing includes the following:

1. Internet availability is one of the main issues, as the service requires an Internet connection while using that service [28][29].
2. protecting intellectual property rights is one of the issues that raises concerns for users of those services, as there are no guarantees that users' intellectual property rights will not be violated [16].
3. Complete reliance on other companies limits the technology used and reduces the flexibility of work for users, and users cannot do anything outside the limits and powers permitted by the companies providing this service [28][30].
4. Lack of technical expertise and skills within university institutions: Many universities lack qualified technical teams to manage cloud computing infrastructure or handle the complexities of migration and configuration [29][30].
5. Legal & Regulatory Issues: some countries or organizations are subject to local laws that prohibit data storage on servers outside the country [29][16].
6. The problem of information security and privacy, which is represented in [28] [29] [30] [16]:
   - Universities lose a degree of control over their data, as this data is stored in computers at another party.
   - The responsibility for protecting data from hackers and system hackers is in the hands of computing service providers, not the university.
   - Multiple leasing, reusing programs and devices among a large number of users leads to a high risk of deleting important data for universities.
   - Sharing storage capacity and service resources: Universities may find it difficult to access their data source and operate their IT team in the cloud, as well as the difficulty of moving to another cloud service provider due to the difficulty of transferring data to another location.

Material and Methods

The methodology and approach adopted in this paper are described below. In this section, the research questions are highlighted and research techniques used are discussed.

Research Questions

In this paper, we have formulated a questionnaire that includes four parts to achieve the purpose of this study as follows:

- General evaluation of cloud computing.
- Evaluation of cloud computing services.
- Difficulties related to university administration.
- Difficulties of applying cloud computing from participants' perspective.

These parts include a set of questions through which we determine the level of familiarity with cloud computing, what are cloud computing services? the extent of readiness to use cloud computing by students and faculty members, and what are the challenges facing the use of cloud computing at the University of Derna, College of Science.

Method and Procedures

This study is empirical research that investigates the level of familiarity and adoption of cloud computing at Derna University. The data collection tool was an electronic questionnaire in four parts to identify the obstacles for employing cloud computing technology at the University of Derna, faculty of Science, from the point of view of students and faculty members. The first part presents a general evaluation of cloud computing, the second part provides information on assessing the evaluation of cloud computing services, and the third part assesses the difficulties of adopting cloud computing by university administration. While the fourth part investigates the difficulties of applying cloud computing from participants' perspectives, table 1 shows that.

The study community is the faculty of science at university of Derna for the academic year 2024-2025: The sample consisted of 106 students and 27 academic members from the faculty of science at the university of Derna. The participants were selected using a non-probabilistic sampling method based on convenience sampling [31]. Face validity and content validity were established by presenting the questionnaire to a panel of experts in the field, who reviewed the items in terms of clarity of wording, accuracy of terminology, relevance to the research topic, and coverage of the intended dimensions. as well as, to ensure the reliability of the questionnaire, Cronbach's Alpha was calculated for each category of the sample (students and faculty members) separately. The results showed acceptable internal consistency (for student group is 0.79 and for the faculty members is 0.71), indicating that the items within each domain reliably measured the intended construct and can therefore be considered a dependable tool for achieving the study objectives.

Table 1: Main Questionnaire Domains and Number of Items

Domain	Number of Items
General evaluation of cloud computing.	8
Evaluation of Cloud Computing Services	7
Challenges Related to University Administration	6
Difficulties of applying cloud computing from participants' perspective	8

Results and discussion

The paper sample was dump on Google forms to gather and analyses the data using descriptive techniques. The descriptive survey was adopted to obtain the opinion of a representative sample of the target population to infer the perception of the entire population.

Descriptive statistics

Table 2 shows the distribution of the participants according to each department, and the educational stage for students. Figure 2 shows the percentage distribution of students who participated in the study across departments. Table 3 shows the distribution of the participants according to department and the academic degree for faculty. Figure 3 illustrates the percentage distribution of faculty members who participated in the study across departments.

Table 2: The number of students according to department and Education level.

Variable	Categories	Participants	Percentage
Department	Computer Science	32	30.2%
	Mathematics	2	1.9%
	Chemistry	31	29.2%
	Physics	2	1.9%
	Botany	3	2.8%
	Zoology	16	15.1%
	Pre-medical	20	18.9%
Educational stage	First Semester	5	4.7%
	Second Semester	27	25.5%
	Third semester	2	1.9%
	Fourth Semester	13	12.3%
	Fifth Semester	1	0.9%
	Sixth Semester	40	37.7%
	Seventh Semester	1	0.9%
	Eighth Semester	1	0.9%
	Graduation Semester	16	15.1%

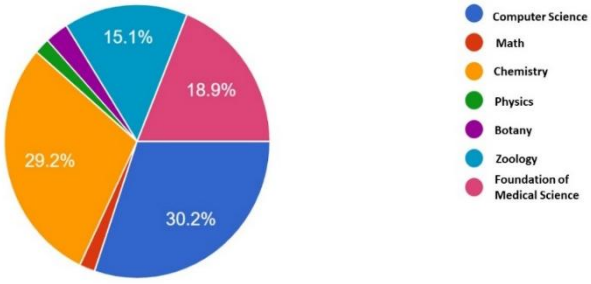

Figure 2: Percentage distribution of participating students across the departments of the Faculty of Science.

Table 3: The number of Faculty according to department and the academic degree.

Variable	Categories	Participants	Percentage
Department	Computer Science	4	14.8%
	Mathematics	6	22.2%
	Chemistry	3	11.1%
	Physics	4	14.8%
	Botany	6	22.2%
	Zoology	3	11.1%
	Pre-medical	1	3.7%
Academic degree	Master's	20	74.1%
	Ph.D.	7	25.9%

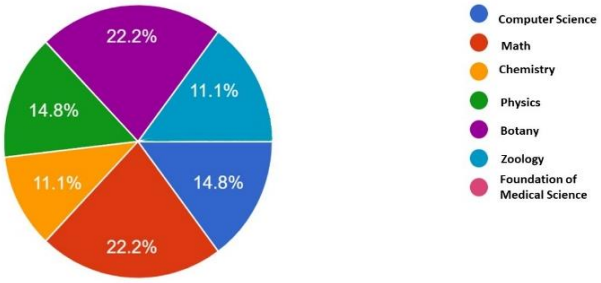

Figure 3: Percentage distribution of participating faculty across the departments of the Faculty of Science.

As illustrated in Figure 4, that most of the respondents hold the degree of master with a total number of 20 by 74.1%. Followed by 7 PH. D with 25.9%.

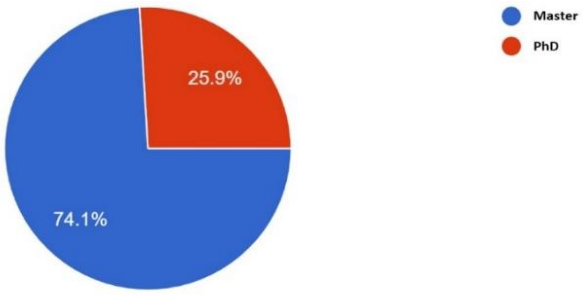

Figure 4: Percentage distribution of participating faculty members across the academic degree (Master's and PhD).

Analytical Statistics

The participants' responses were analysed using both descriptive and inferential statistical methods. The questionnaire consists of four main parts, each containing a set of statements and questions. Each

statement was followed by a set of responses on a five-point Likert scale to measure stratification levels, while each question was followed by binary responses (Yes/No) to measure opinions. Descriptive statistics were applied to calculate the means and standard deviations for the Likert-scale items, while percentages were computed to represent the distribution of responses for the Yes/No questions. SPSS software was used to analyse all the responses statistically.

The first part of the questionnaire: *General evaluation of cloud computing.*

The first part includes 8 statements were designed to assess the availability and effectiveness of cloud computing services. Descriptive statistical analysis was applied to identify participants' perceptions regarding these services, as shown in Tables 4 and 5. In the first section of the questionnaire, the participants were asked to specify the types of cloud computing services they have previously used ("What type of cloud computing have you used before?"). To simplify accurate responses, a range of service categories was listed, including: cloud of social media services (e.g., Facebook, Skype, Viber), cloud of video streaming and presentation browser services (e.g., Google Browse, YouTube), cloud storage services (e.g., Dropbox, Google Drive), research cloud services (e.g., Google Scholar, keyword search tools), cloud office applications services (e.g., MS Office Online, Adobe Reader), and university email services. Figure 5 and 6 presents the percentage distribution of students' and faculty members' interactions with the different categories of cloud computing services identified in the questionnaire.

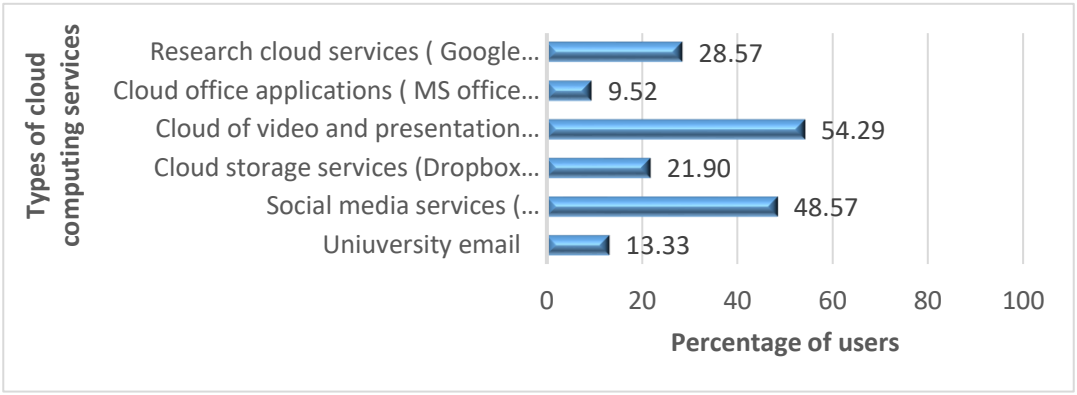

Figure 5: Percentage Distribution of Cloud Computing Services Used by Students.

As shown in Figure 5, the highest percentage of cloud computing usage among students was recorded for cloud video streaming and presentation browser services, reaching 54.29%. This indicates significant usage of platforms that support visual and interactive learning, which may be due to their ability to facilitate access to educational videos, recorded lectures, and multimedia presentations that enhance understanding and engagement. The second most used category was cloud-based social media services (e.g., Facebook, Skype, Viber) with 48.57%, reflecting the importance of social networking platforms in academic communication, collaboration, and information sharing. Conversely, the lowest usage was reported for cloud office application services (e.g., MS Office Online, Adobe Reader) and university email services, with 9.52% and 13.33%, respectively, suggesting either limited awareness of these tools' capabilities or a preference for alternative offline or personal solutions

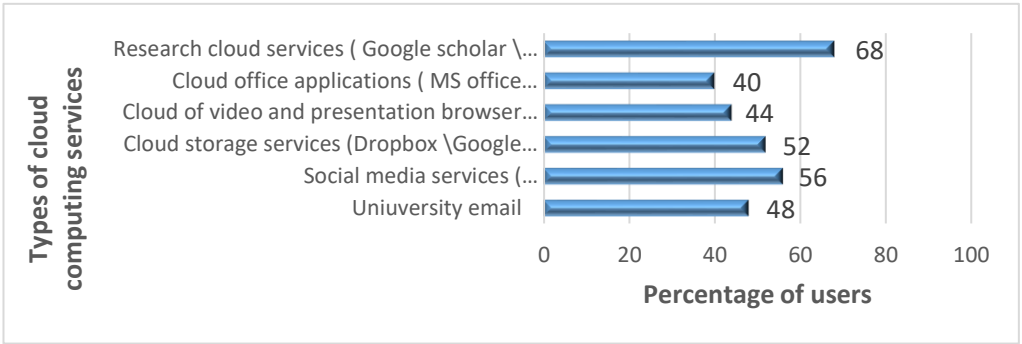

Figure 6: Percentage Distribution of Cloud Computing Services Used by faculty members.

As shown in Figure 6 the highest usage rate of cloud computing services was observed in the category of research cloud services (86%), which is expected given the direct relevance of this category to their academic and research responsibilities. These tools provide quick access to scholarly articles and references, as well as facilitate advanced search processes and the organization of research outputs. The second most used category was cloud of social media services (56%), reflecting the role of these platforms in enhancing academic communication and building collaborative networks among colleagues and students, in addition to their use as channels for knowledge distribution and updates. on the contrary, the lowest usage rates were recorded for cloud office application services (40%) and cloud of video streaming and presentation browser services (44%), which may indicate faculty reliance on traditional or locally installed tools for completing administrative tasks, or a relatively limited use of visual media in delivering educational content compared to research activities and academic communication.

In Table 4, the question "Have you ever used a cloud-based platform to assist your colleagues?" about half of the students (53.33%) reported that they had such experience, compared to a notably higher proportion among faculty members (76%). This difference refers to that the faculty members may have more exposure to collaborative tools and a stronger tendency to utilize cloud-based platforms in a professional or academic context. The relatively high percentage of students who have not used such platforms (46.66%) may refer to a need for increased training and awareness of collaborative cloud tools for the student community.

Table 4: Distribution of Yes/No responses for general evaluation of cloud computing dimension among students and faculty members

NO.	Item Statement	YES (n%) (Student)	NO (n%) (Student)	YES (n%) (Faculty)	NO (n%) (Faculty)
2	Have you ever used a cloud-based platform to assist your colleagues?	56 (53.33%)	49 (46.66)	19 (76%)	6 (24%)
3	Are you willing to use online tests in your courses through cloud services such as Google Classroom?	85 (80.95%)	20 (19.05%)	23(92%)	2(8%)

Regarding the readiness to use online tests through cloud services such as Google Classroom, the results show a strong positive inclination from both groups. A substantial majority of students (80.95%) expressed readiness, while this percentage was even higher among faculty members (92%). This high acceptance rate indicates recognition of the benefits of cloud-based tools, such as accessibility, efficiency, and integration with the learning process. The small proportion of participants who expressed unwillingness suggests that barriers to adoption may be minimal, potentially related to technical familiarity or personal preference rather than resistance to the concept itself. Generally, these findings indicate a generally favorable attitude towards integrating cloud-based tools into the academic environment, with faculty members showing slightly higher levels of prior experience and willingness compared to students. This trend underscores the potential for expanding cloud-based applications in both teaching and collaborative academic work, provided that adequate support and training are in place to address any remaining gaps in familiarity or skills.

In Table 5, The results show a general agreement between students and faculty members regarding the importance of cloud computing in the higher educational environment. Most items scored in the high level, reflecting a positive awareness and clear understanding of the practical benefits of this technology. The highest mean score among students was recorded for the statement “using cloud computing encourages group projects and supports the educational process” (M = 4.19), followed by “Using cloud computing is considered keeping up with modern technologies” (M = 4.14), both rated at a high level. Similarly, the faculty members assigned the highest mean score for similar items (M = 4.40), followed by (M = 4.32), indicating agreement between the two groups on the significance of collaboration and technological advancement as key advantage of cloud computing. Participants also demonstrated awareness of the technical advantages of cloud computing, particularly in providing centralized storage for data and applications, and enabling the use of services without the need for software installation, with mean scores ranging from 4.11 to 4.28 for both groups.

However, the statement “I have a good understanding of cloud computing” received the lowest relative mean, especially among faculty members (M = 3.40), moderate level), which may suggest the need for enhanced awareness of the theoretical aspects of cloud computing. In addition, the relatively

high standard deviations for some items indicate variations in participants' experience for using cloud computing services.

Table 5: Mean and standard deviation for the Items of the general evaluation of cloud computing dimension using a Likert scale among students and faculty members.

NO.	Item Statement	Mean (Students)	Standard Deviation (Students)	Level	Mean (Faculty)	Standard Deviation (Faculty)	Level
4	I have a good understanding of cloud computing.	3.51	3.12	High	3.4	3.06	Median
5	Using cloud computing is considered keeping up with modern technologies.	4.14	3.73	High	4.32	3.83	High
6	I believe that using cloud computing encourages group projects and supports the educational process.	4.19	3.76	High	4.4	3.92	High
7	Cloud computing provides centralized storage capabilities for applications and information.	4.11	3.68	High	4.28	3.79	High
8	It is possible to use all cloud services without the need to install software on users' devices.	3.82	3.43	High	4.2	3.71	High

Overall, the results indicate a generally positive perception of cloud computing among both students and faculty members, with minor differences in the level of understanding, highlighting the importance of targeted training programs to bridge these gaps.

The Second part of the questionnaire: *Evaluation of Cloud Computing Services*

The second part included 7 statements were designed to assess the quality of cloud computing services. Descriptive statistical analysis was conducted to identify participants' perceptions regarding these services as shown in Tables 6 and 7.

In Table 6, it is noticed that the willingness of students and faculty members to adopt cloud computing in academic courses in the future, with a percentage of 94.29% for students' group and 92% for the faculty group. This remarkable inclination toward future adoption reflects a favorable environment for the expanded use of cloud technologies in academic contexts. In respect to the question: " Have you used any cloud computing services to support your research and studies?", it is found that the majority of respondents in both groups reported using cloud services to support their research and academic work, with rate (students= 78.10% for students group and 80% for faculty group). These high rates confirm the recognized value of cloud technologies in enhancing scholarly productivity.

For the question " Do you use these services to store your personal information and files?", 65.71% of students and 72% of faculty members reported using cloud services. Although these percentages are substantial, they are lower compared to research-related use, possibly reflecting concerns about data security or a preference for alternative storage solutions.

The results for the question "Have you ever used one of these services in any of your academic courses?" are as follows: 71.43% for the students' group and 64% for the faculty group. These findings refer to a relatively high level of adoption among both groups, although the lower percentage among the faculty group may reflect differences in teaching approaches, levels of technological familiarity, or the perceived relevance of these services to course delivery. Generally, these findings demonstrate substantial current utilization of cloud computing services in the academic environment, accompanied by even stronger intentions for future adoption. Differences between students and faculty members are generally modest, suggesting that institutional initiatives to promote cloud integration could effectively target both groups simultaneously.

Table 7 presents the descriptive statistics, including the mean and standard deviation. These statistics results are reported separately for students and faculty members using a Likert scale.

Regarding the statement "Using these services is easy and saves a lot of time and effort," both students and faculty members exhibit a very high level of agreement. Specifically, students provided a mean score of 4.29 (SD = 3.85), while faculty members showed a slightly higher mean of 4.36 (SD = 3.87). This refers to a strong consensus across both groups that cloud computing services contribute positively to ease of use and efficiency in their academic activities**.**

For the statement, "I believe that cloud computing facilitates access to academic content," the mean scores were similarly favorable, 4.22 (SD = 3.77) for the students and 4.20 (SD = 3.78) for the faculty members, reflecting a very high positive perception. This subtle difference indicates that while both groups recognize the advantages of cloud computing in enhancing accessibility, students may perceive these advantages marginally more strongly than faculty members.

Table 6: Distribution of Yes/No responses for Items of evaluation of cloud computing services dimension among students and faculty members.

NO.	Item Statement	YES (n%) (Students)	NO (n%) (Students)	YES (n%) (Faculty)	NO (n%) (Faculty)
1	Have you used any cloud computing services to support your research and studies?	82 (78.10%)	23 (21.90%)	20 (80%)	5 (20%)
2	Do you use these services to store your personal information and files?	69 (65.71%)	36 (34.29%)	18 (72%)	7 (28%)
3	Have you used these services to share a link with others?	73 (69.52%)	32 (30.48%)	17 (68%)	8 (32%)
4	Have you ever used one of these services in any of your academic courses?	75 (71.43%)	30 (28.57%)	16 (64%)	9 (36%)
5	Would you like to use one of these services in your academic courses in the future?	99 (94.29%)	6 (5.71%)	23 (92%)	2 (8%)

Table 7: Mean and standard deviation for the Items of evaluation of cloud computing services dimension using a Likert scale among students and faculty members

NO.	Item Statement	Mean (Students)	Standard Deviation (Students)	Level	Mean (Faculty)	Standard Deviation (Faculty)	Level
6	Using these services is easy and saves a lot of time and effort.	4.29	3.85	Very high	4.36	3.87	Very high
7	I believe that cloud computing facilitates access to academic content	4.22	3.77	Very high	4.2	3.78	High

Generally, the high mean scores and comparable standard deviations in both item statements imply a shared positive position towards cloud computing services, highlighting their perceived importance in supporting academic tasks efficiently and improving content accessibility. The consistency in responses between students and faculty members reinforces the potential value of integrating cloud technologies further within the academic environment.

The third part of the questionnaire: *Challenges Related to University Administration*

The third part of the questionnaire, that address challenges related to university administration in implementing cloud computing, consisted of 6 statements as shown in Table 8. This part aims to assess participants' perceptions regarding infrastructure readiness, financial and technical support, and the role of decision-makers in facilitating or obstructing the implementation process. The results shown in table 8 indicate that both students and faculty members generally perceive the challenges related to university administration in implementing cloud computing as being at a high level. Regarding all statements, the mean scores for students ranged between 4.03 and 4.35, while for faculty members ranged between 4.16 and 4.56, reflecting a consistent agreement on the acuity of these issues.

The highest-rated challenge among students, which was categorized as very high for the statement: "The university suffers from weak infrastructure" (mean = 4.35, SD = 3.94). This reflects a significant impact of inadequate infrastructure, including weak internet services and unreliable power supplies, on

the adoption of cloud computing. Similarly, faculty members also rated this challenge highly (mean = 4.56, SD = 4.11), indicating a shared recognition of this obstacle. Another highly rated challenge determined by both groups represented in the statement: "Insufficient support and funding to implement cloud computing" (Students: Mean = 4.32, SD = 3.92; Faculty: Mean = 4.56, SD = 4.07). These findings suggest that financial and administrative support is a serious barrier to cloud computing integration. The item statements "There is a need to provide qualified and competent staff to solve technical issues related to cloud computing" and "Frequent power outages" were also rated highly by both groups, highlighting the operational and human resource limitations faced by the institution. Interestingly, the lowest-rated item for students was "There is no real adoption by university decision-makers" (Mean = 4.10, SD = 0.91); it still falls within the high level, referring to that though decision-making plays a role, infrastructure and funding issues are viewed as more demanding.

Table 8: Mean and standard deviation for the Items of challenges related to university administration dimension using a Likert scale among students and faculty members.

NO.	Item Statement	Mean (Students)	Standard Deviation (Students)	Level	Mean (Faculty)	Standard Deviation (Faculty)	Level
1	The lack of cloud computing usage at the university is due to the unavailability of an internet network.	4.05	3.67	High	4.16	3.74	High
2	Frequent power outages	4.03	3.67	High	4.2	3.78	High
3	The university suffers from weak infrastructure (such as power generators, internal network, and strong internet connection).	4.35	3.94	Very high	4.56	4.11	High
4	There is insufficient support and funding to implement cloud computing at the university.	4.32	3.92	Very high	4.56	4.07	High
5	There is a need to provide qualified and competent staff to solve technical issues related to cloud computing.	4.32	3.91	Very high	4.44	3.96	High
6	There is no real adoption by university decision-makers to activate cloud computing.	4.10	3.67	High	4.24	3.78	High

In summary, the high mean scores obtained for all item statements in this part indicate a significant agreement among participants for various factors, which are considered significant barriers to the adoption of cloud computing at the university. Such factors are represented in the lack of internet availability, frequent power outages, weak infrastructure, insufficient funding and support, a shortage of qualified technical staff, and the absence of real adoption by decision-makers.

The fourth part of the questionnaire: *Difficulties of applying cloud computing from participants' perspectives*

The findings related to the fourth part of the questionnaire, as shown in Table 9, refer to that both students and faculty members identified several prominent challenges hindering the effective adoption of cloud computing in higher education. The highest-rated difficulty among students (M = 4.17, SD = 3.75) was the absence of educational activities that support the use of cloud computing, followed by a lack of awareness of its significance (M = 4.12, SD = 3.72). Faculty members shared similar perceptions, with high mean scores for both issues (M = 4 and M = 3.95, respectively), indicating that awareness and pedagogical integration remain critical barriers.

Another important challenge noted by both groups is that some faculty members face in innovating and adopting modern teaching methods (students: M = 4.01, faculty: M = 4.2), indicating a persistent reliance on traditional instructional approaches and a potential gap in adopting technology-enhanced pedagogies, as well as a lack of direct support and motivation from faculty members towards

students (students: M = 4.09, faculty: M = 3.8). These results indicate a focus on the role of institutional and interpersonal support in facilitating technology adoption. The unavailability of internet services was also a notable barrier (students: M = 4.06, faculty: M = 3.92), confirming the need for robust technological infrastructure as a prerequisite for cloud integration. Another challenges such as lack of suitable devices that represented in the statement:" The student does not accept the idea of cloud computing." (students: M = 3.40, faculty: M = 3.48) (students: M = 2.81, faculty: M = 3.48) were rated at a moderate level, indicating that while these factors exist, they are less influential compared to awareness, training, and infrastructure issues.

Table 9: Mean and standard deviation for the Items of difficulties of applying cloud computing from participants' perspectives Dimension using a Likert scale among students and faculty members.

NO.	Item Statement	Mean (Students)	Standard Deviation (Students)	Level	Mean (Faculty)	Standard Deviation (Faculty)	Level
1	Lack of awareness of the importance of cloud computing in higher education.	4.12	3.72	High	3.95	3.57	High
2	Absence of educational activities that support the use of cloud computing.	4.17	3.75	High	4	3.66	High
3	Some faculty members find it difficult to innovate and adopt modern teaching methods.	4.01	3.64	High	4.2	3.76	High
4	Students lack direct support and motivation from faculty members.	4.09	3.69	High	3.8	3.42	High
5	The unavailability of internet service for some students makes it difficult to use cloud computing.	4.06	3.72	High	3.92	3.53	High
6	I do not have a suitable device to use these tools.	3.40	3.10	Mode rate	3.48	3.16	High
7	The student does not accept the idea of cloud computing.	2.81	2.52	Mode rate	3.48	3.15	High
8	I prefer traditional methods over cloud-based tools.	2.99	2.76	Mode rate	2.8	2.58	Mode rate

On the other hand, the results show that the lowest mean value for both groups was in the item statement: "I prefer traditional methods over cloud-based tools ", (students: M =2.99, faculty: M =2.8). This indicates a general openness and positive position toward integrating modern technological tools into teaching and learning processes. Such a finding is encouraging, as it implies that if adequate training, infrastructure, and institutional support are provided, the transition from traditional methods to cloud-based solutions is likely to be accepted and embraced by both students and faculty members. In general, the results underscore the importance of targeted awareness campaigns, faculty training programs, and improved internet infrastructure to overcome the highlighted barriers and foster a supportive environment for cloud computing integration in higher education.

Conclusion

This paper aimed to investigate the extent of cloud computing adoption and the challenges of its use in the academic environment of the Faculty of Science at the University of Derna. By using a survey methodology targeting both students and faculty members, the paper provided valuable insights into the current usage pattern and perceptions of cloud services in academic courses. The finding dissects a considerable acceptance and utilization of cloud computing tools, especially among students, indicating their growing role in supporting educational activities and collaboration. However, the study also identified key obstacles that hinder wider adoption, including infrastructural deficiencies, Unavailability of internet, and a lack of sufficient digital skills among some faculty members and students. General, this research contributes to a deeper understanding of how cloud computing is integrated into higher education in a developing context and highlights areas where institutional support

and strategic planning are crucial to enhance technology adoption. These insights give a foundation for future efforts aimed at leveraging cloud technologies to improve teaching and learning outcomes. Based on these results, several strategic measures are recommended to overcome the identified challenges and promote sustainable cloud computing integration at the University of Derna, as follows:

- **Infrastructure Enhancement**: Establish a dedicated service network supported by reliable, high-speed internet connectivity to meet the requirements of academic and research activities.
- **Capacity building:** Conduct training programs for faculty members and students about the effective use of cloud computing services tailored to educational needs, beside awareness initiatives highlighting the significance of these services in higher education.
- **Institutional Policy Development:** Establish clear policies, guidelines, and standard operating procedures for cloud computing adoption, supported by a specialized technical support team to assure smooth implementation.

References

[1] Mell, Peter, and Timothy Grance. "The NIST Definition of Cloud Computing. Gaithersburg, MD: National Institute of Standards and Technology, 2011.

[2] Zhang, Qi, Lu Cheng, and Raouf Boutaba. "Cloud Computing: State-of-the-Art and Research Challenges." Journal of Internet Services and Applications 1, no. 1 (2010): 7–18.

[3] Marston, Sean, Zhi Li, Subhajit Bandyopadhyay, Juheng Zhang, and Ananth Ghalsasi. "Cloud Computing—The Business Perspective." Decision Support Systems 51, no. 1 (2011): 176–189.

[4] Sonali Sachdeva, Saurabh Bhatia, Ahmed Al Harrasi, Yasir Abbas Shah, K. Anwer, and Anil K. Philip et al. "Unraveling the role of cloud computing in health care system and biomedical sciences." *Heliyon*, 10 (2024).

.[5] H. Moghaddasi and Alireza Tabatabaei Tabrizi. "Applications of Cloud Computing in Health Systems." *Global Journal of Health Science*, 9 (2016): 33.

[6] Chinazor Prisca Amajuoyi, Luther Kington Nwobodo and Mayokun Daniel Adegbola. "Transforming business scalability and operational flexibility with advanced cloud computing technologies." *Computer Science & IT Research Journal* (2024).

[7] Riste Temjanovski. "Cloud computing in logistic and Supply Chain Management environment." *Journal of Economics* (2021).

[8] Deekshitha Kosaraju. "Artificial Intelligence in Cloud Computing: Enhancements and Innovations." *Galore International Journal of Applied Sciences and Humanities* (2024).

[9] Et al. Sadargari Viharika. "Survey on Cloud Computing Integrated with Artificial Intelligence." *International Journal on Recent and Innovation Trends in Computing and Communication* (2023).

[10] Prerna Patil, Charvi Kumar, Dr. Rutuja Kadam and Yatin Gandhi. "An Analysis of Emerging Cybersecurity Threats in Cloud Computing." *Computer Fraud and Security* (2024).

[11] Rushi Dave. "Cybersecurity in Cloud Computing Environments: Challenges and Solutions." *INTERANTIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT* (2025).

[12] Nabil Sultan, “Cloud Computing for Education: A New Dawn?” International Journal of Information Management 34, no. 2 (April 2014): 107–116.

[13] Mohammed Alshammari and Adel Bahaddad, “Cloud Computing in Higher Education Institutions: Pros and Cons,” International Journal of Advanced Computer Science and Applications 12, no. 5 (2021): 200–210.

[14] Yuliya Yu. Vassunova. "APPLICATION OF CLOUD TECHNOLOGIES IN EDUCATIONAL PROCESSES OF THE UNIVERSITY." *EKONOMIKA I UPRAVLENIE: PROBLEMY, RESHENIYA* (2024).

[15] L. S. Riza, Jaumin Ajdari and Mentor Hamiti. "Challenges of Adoption of Cloud Computing Solutions in Higher Education: Case Study Republic of Kosovo." *2023 46th MIPRO ICT and Electronics Convention (MIPRO)* (2023): 613-618.

[16] Chia Zhi Xuan and Muhammad Ehsan Rana. "Revolutionizing Higher Education: A Critical Analysis of Cloud Computing's Impact, Suitability, and Challenges." 2024 ASU International Conference in Emerging Technologies for Sustainability and Intelligent Systems (ICETSIS) (2024): 733-738.

[17] Abdallah, Nahil, Odeh Abdallah, and Jamal Zaid Kielani. “Exploring Key Factors Influencing the Adoption of Mobile Cloud Computing in Higher Education: Case Study at An-Najah University.” *International Journal of Instruction* 17, 2024 no. 3: 695–714.

[18] Al-Hajri, Salim Amor, Abdelghani Echchabi, Abdullah Mohammed Ayedh, and Mohammed Mispah Said Omar. “The Cloud Computing Systems’ Adoption in the Higher Education Sector in Oman in Light of the COVID-19 Pandemic.” *International Journal of Evaluation and Research in Education* 10, 2021 no. 3: 930–937.

[19] Imraja, Najwa A., Bothaina F. Gargoum, Entesar H. Alfsai, and Abdelsalam M. Maatuk. “A Cloud Computing Model for Libyan Higher Education Institutions.” In *Proceedings of the IEEE 3rd Maghreb Meeting on Automatic Control & Computer Engineering (MI-STA)*. IEEE, 2023.
[20] Ekaba Bisong. "What Is Cloud Computing?." *Cloud Technologies* (2019).
[21] R. Buyya, Chee Shin Yeo, S. Venugopal, J. Broberg and I. Brandić. "Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility." *Future Gener. Comput. Syst.*, 25 (2009): 599-616.
[22] Rajkumar Buyya, James Broberg, and Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, “Introduction to Cloud Computing” (Hoboken, NJ: Wiley, 2011).
[23] Michael Armbrust, Armando Fox, Rean Griffith, Anthony D. Joseph, anf Randy Katz, et al, “A View of Cloud Computing,” Communications of the ACM 53, no. 4 (April 2010): 50–58.
[24] Lian Qian, Zhimin Luo, Yujian Du, and Leitao Guo, “Cloud Computing: An Overview,” in *CloudCom 2009: First International Conference on Cloud Computing*, Beijing, China, December 2009 (Berlin: Springer, 2009).
[25] Ampera D. Baharuddin, Hilda Fibriasari, M. Arif Rahman Sembiring, and Hamid Hamid, “Implementation of Cloud Computing System in Learning System Development in Engineering Education Study Program,” *International Journal of Education in Mathematics, Science and Technology (IJEMST)* 9, no. 4 (2021): 728–740.
[26] Md Aminur Islam, Faisal Bin Abul Kasem, and others, “Cloud Computing in Education: Potentials and Challenges for Bangladesh,” *International Journal of Computer Science, Engineering and Applications (IJCSEA)* 7, no. 5 (October 2017).
[27] Kiran Yadav, “Role of Cloud Computing in Education,” *International Journal of Innovative Research in Computer and Communication Engineering* 2, no. 2 (February 2014).
[28] P. Saraswat and Swapnil Raj. "Cloud Computing In Higher Education." *International Journal of Innovative Research in Computer Science & Technology* (2021).
[29] Hakan Aydin. "A Study of Cloud Computing Adoption in Universities as a Guideline to Cloud Migration." *SAGE Open*, 11 (2021). https://doi.org/10.1177/21582440211030280.
[30] Benedict Ladi Anak Bangkong, Muhammad Ehsan Rana and Vazeerudeen Abdul Hameed. "Overcoming the Challenges of Implementing Cloud Computing in Higher Education." *2023 4th International Conference on Data Analytics for Business and Industry (ICDABI)* (2023): 341-346.
[31] Salkind, N.J. Métodos de Investigación; Pearson Educación: London, UK, 1999.